



# **VIRTUAL CLUSTER SWITCHING**

**CZYLI:**

**CO SIEĆ MOŻE ZROBIĆ DLA  
WIRTUALIZACJI?**



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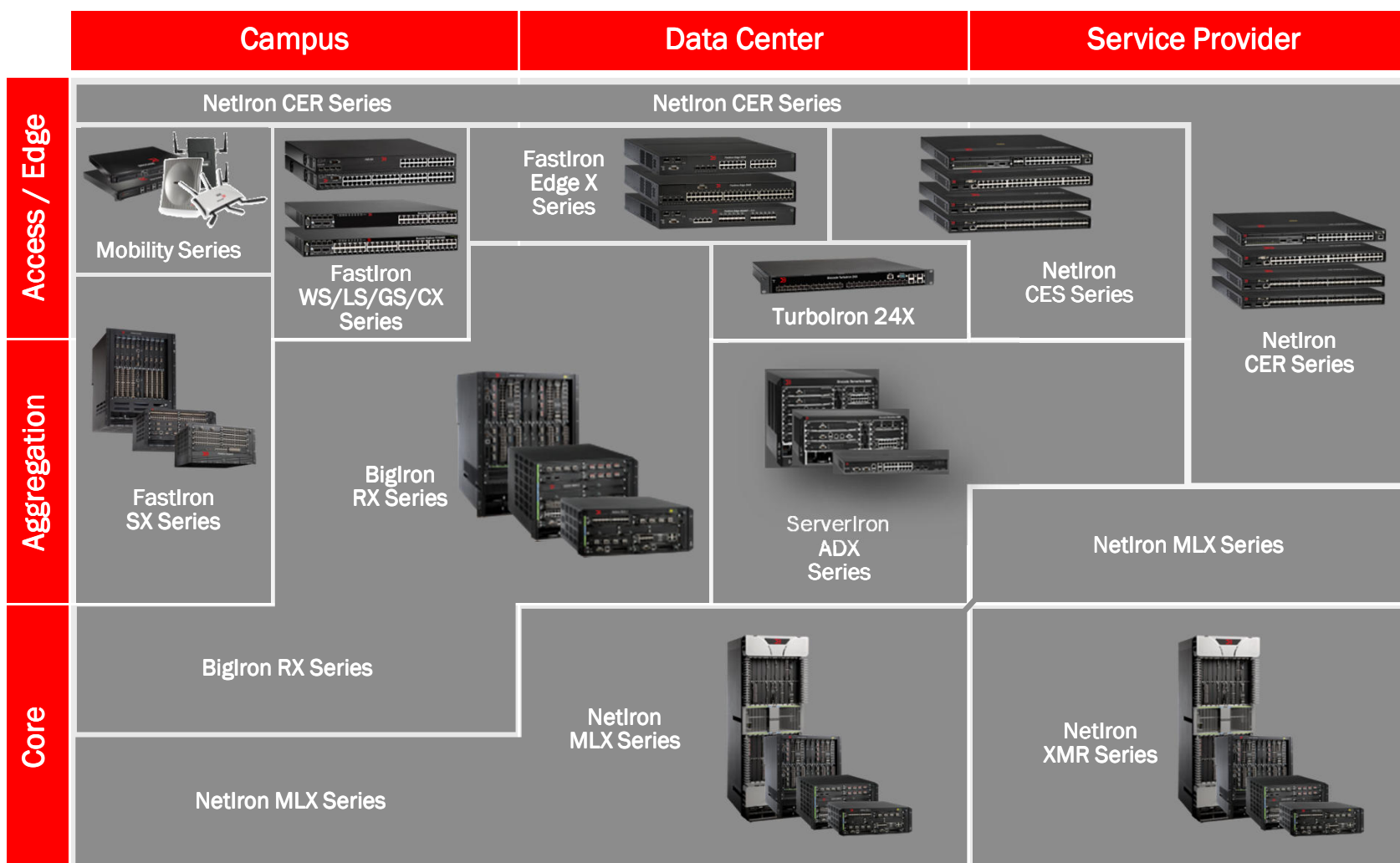
Grudzień 2010

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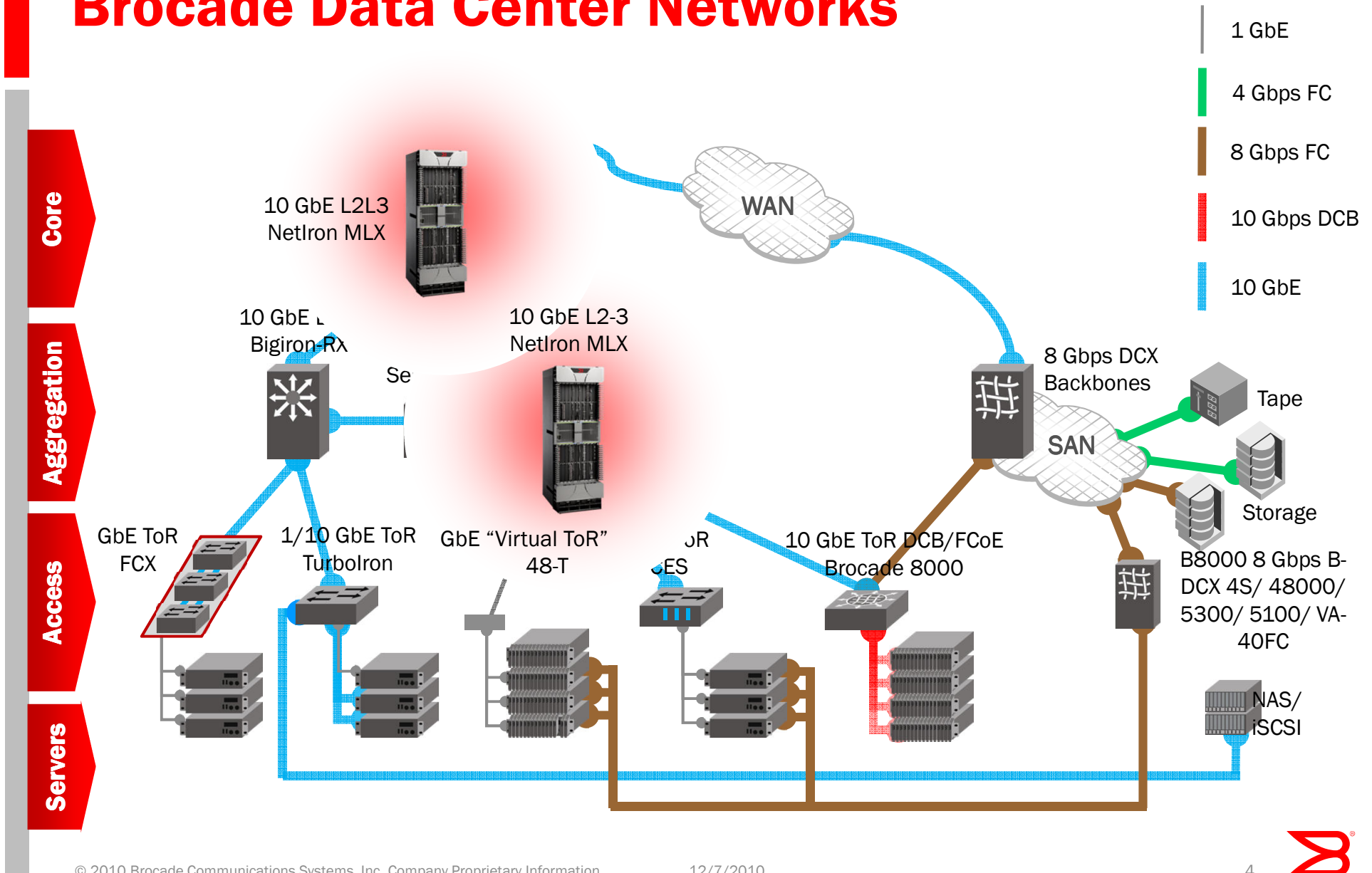
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# Brocade IP Networking Product Positioning



# Brocade Data Center Networks



# MLXe and 100G Ethernet



# Next Generation Advanced Router

## MLXe Product Highlights

**A  
Unified  
Platform  
That  
Scales  
From  
Data  
Center  
to  
Service  
Provider  
Core**

Industry-leading switch fabric capacity of **15.36 Tbps**

Industry-leading 1G wire-speed density **1536 ports**

Industry-leading 10G wire-speed density of **256 ports**

Industry-leading 100G wire-speed density of **32 ports**

**Investment protection** - Supports all the existing MLX modules

Highly optimized hardware and software for **continuous operation**

Future-ready for timing distribution (**Sync-E, 1588**)

Ability to use XMR modules- **XMR level Scalability**

**Rear exhaust** for all MLXe models

**NEBS Level 3** Certified ( pending)





# Brocade MLXe Series

## Product Highlights



### Ideal for...

- ✓ High performance computing
- ✓ Dense data centres
- ✓ Very large-enterprise access, aggregation or core

- ✱ 15.36 Tbps fully Distributed Architecture
- ✱ Lossless fabric
- ✱ Wire-speed routing 4.8 Gpps IPv4/IPv6/MPLS
- ✱ DCB (Data Centre Bridging) ready
- ✱ Industry-leading 100G port density
- ✱ Carrier-grade QoS
- ✱ NEBS L3 compliant
- ✱ Rear exhaust on all models
- ✱ High Availability design:
  - ✓ Redundant management modules
  - ✓ Redundant switch fabrics
  - ✓ Redundant power supplies & fans
  - ✓ Hitless failover
  - ✓ Hitless software upgrades
  - ✓ Node/link failover of **sub-200msec**

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# Next Generation Advanced Router

## 100 GbE Product Highlights

Industry's first **2 port** 100 GbE module

Massive 100 GbE density of **32 wire-speed** ports

Multiple **full** 100 Gigabit packet processors.

**Terabit trunks** with 1.6 Tb/s per trunk.

**Ports on Demand** enabling pay as you grow strategy

Classic XMR and MLX chassis support 1-port 100 GbE

**Full featured** card with Advanced MPLS and IPv4/IPv6 capabilities

1 million IPv4 and 240 K IPv6 FIB capacity

**802.3ba** compliant and supports CFP based optics





# Why MLXe For Data Center?

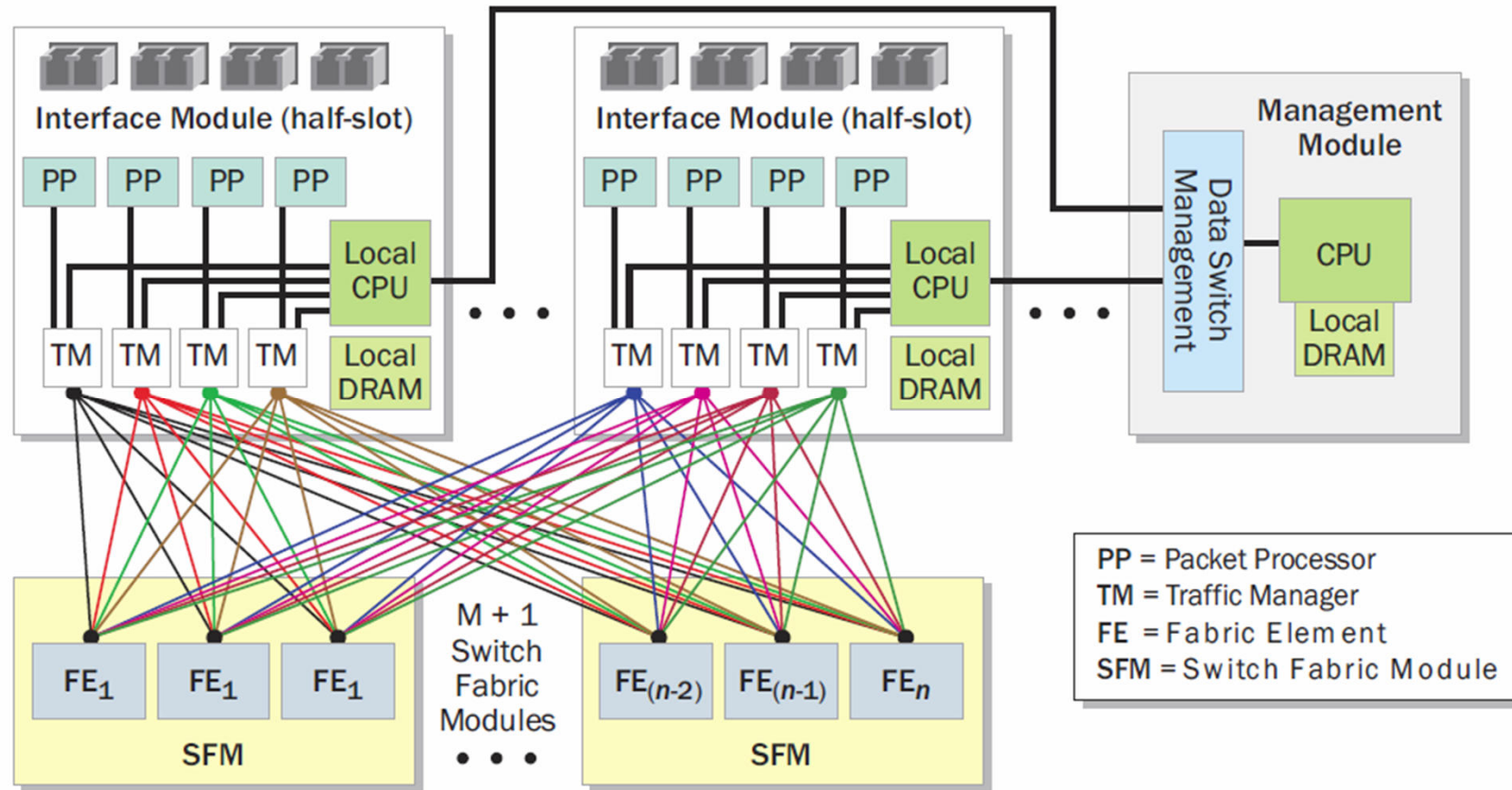
## Technical/Competitive Advantages & Business Benefits

- Multi-Chassis Trunking (MCT) for active-active links
  - Simplifies configuration, increases resiliency and optimizes network design
  - Solution against Cisco VSS and vPC offering
- Over 30Tbps capacity in a dual-chassis for virtual data centers
  - Less infrastructure/collapsed network layers; avoids traffic congestion; fewer elements to manage
  - At 4.8Bpps, MLXe delivers 5x IPv6 throughput vs. Nexus 7k
- 32x 100GbE wire-speed ports for demanding data centers
  - Leadership and investment protection path
  - Aggregate 10 10GbE links – simplifies management
- Advanced features without performance degradation
  - Address DCI, network virtualization, resiliency and IPv6 requirements



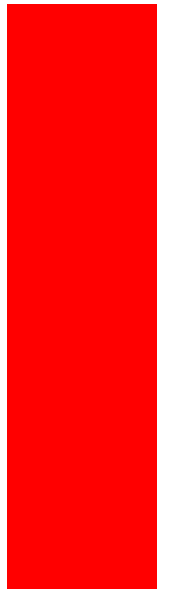
# NetIron MLX Series

## Clos Fabric Architecture



# Brocade's Next Generation Data Centre

Simplifying the Data Center

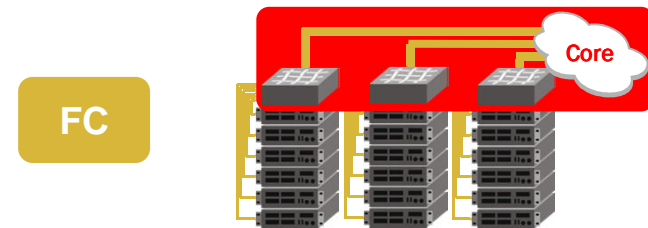


# Access Layer Technologies

Brocade's continuing innovation at the network edge

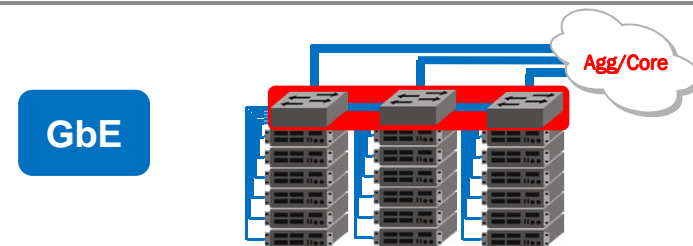
## Access Gateway – 300, 5100, VA-40FC

- Virtualizes Fibre Channel ports at the edge
- Eliminates network scalability constraints
- Drastically reduces management of edge switches
- Flexibility to support multiple heterogeneous fabrics



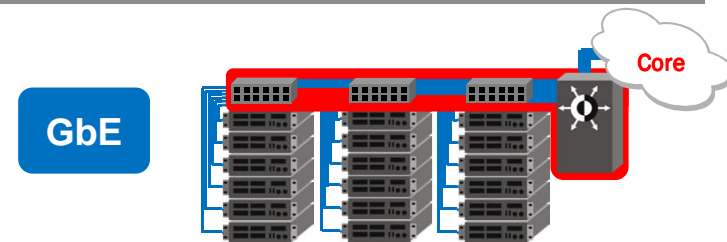
## Horizontal Stacking – FCX

- Unifies top-of-rack switches across a row of servers
- Manage a row of switches as one
- High speed connection between edge switches



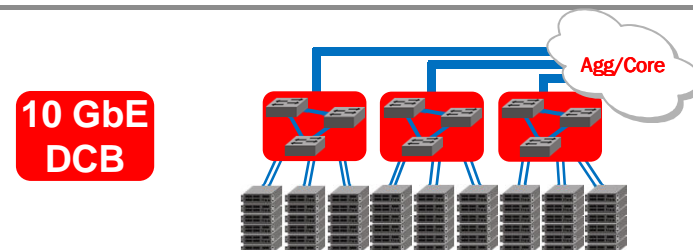
## Virtual Top-of-Rack – MLX + 48T blade

- Top-of-Rack connectivity without switch management complexity
- Ultra high density Gigabit solution - over 1000 ports
- Collapses the access and aggregation layer
- Patch panels at the top of each rack for simplified cabling



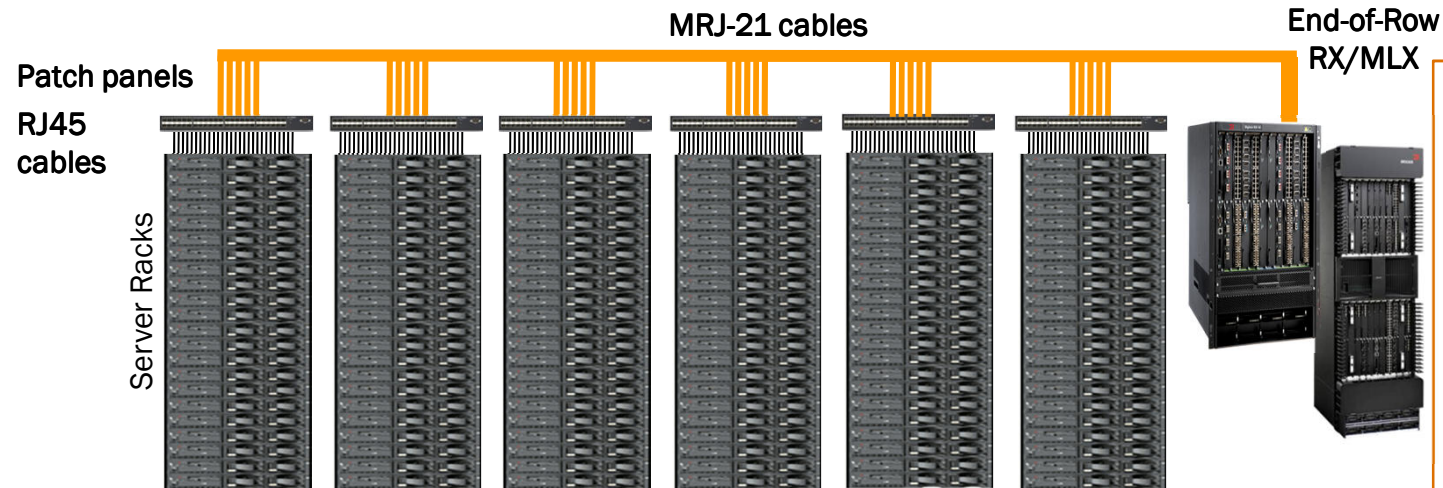
## Virtual Cluster Switching – VDX

- Scale-out, multi-path, highly resilient layer 2 fabric
- Self forming and masterless through Distributed Intelligence
- Manage the fabric as a single Logical Chassis



# The Brocade Solution

“Virtual Top of Rack” for dense 1 GbE server access



- Servers connect to patch panels that are located within the same rack
- RX/MLX at EOR connect to patch panel with mrj21 trunk cables
- Each patch panel supports 48 RJ45 connectors (per rack)
- MRJ21 trunk cable highlights:
  - Each MRJ21 cable contains 6x1 GbE cables. Lay 1 cable vs. 6 cables
  - 30% thinner and 20% lighter vs. equivalent cat5 cable



For more information on mrj21 cables: [www.ampnetconnect.com/brocade](http://www.ampnetconnect.com/brocade)

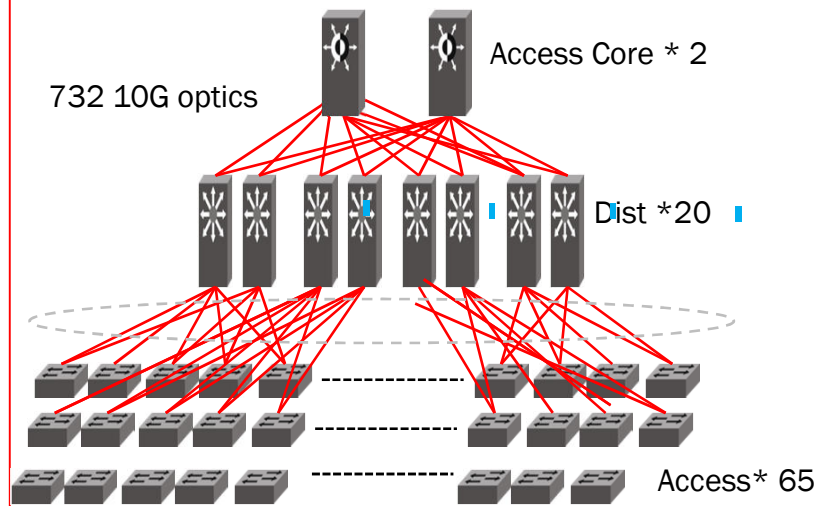


# Real World Data Centre

## Solution Benefits

- Standard ToR solutions

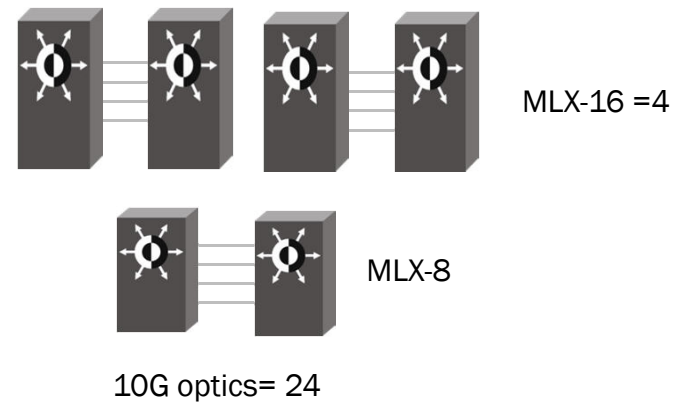
### Eighty Seven switch solution



**Complexity and increased cost to achieve scalability**

### Brocade's Virtual ToR solution

### Five switch NetIron MLX solution



**Scalability to simplify and reduce Capital and operational cost**

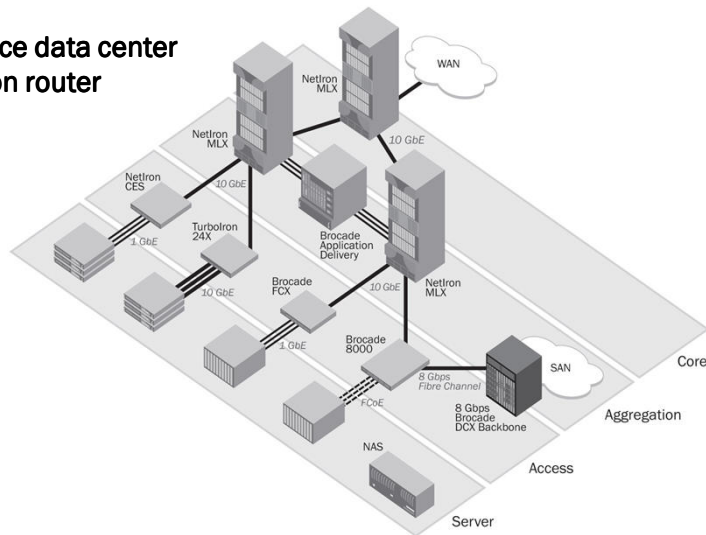




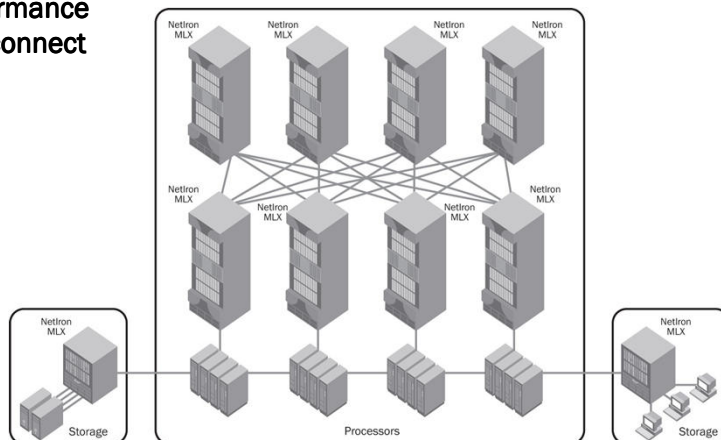
# Customer Deployments

## Data Center and Enterprise IP Networks

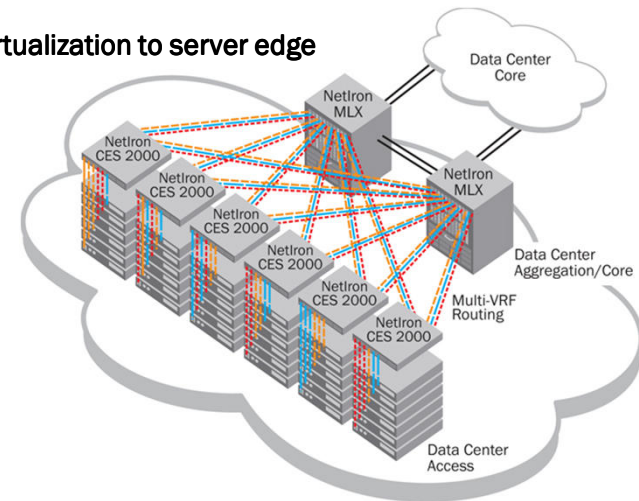
High-Performance data center core/aggregation router



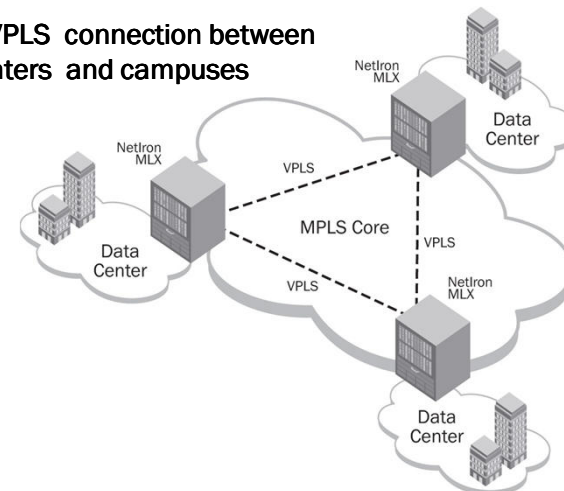
High-Performance R&D interconnect



Network virtualization to server edge



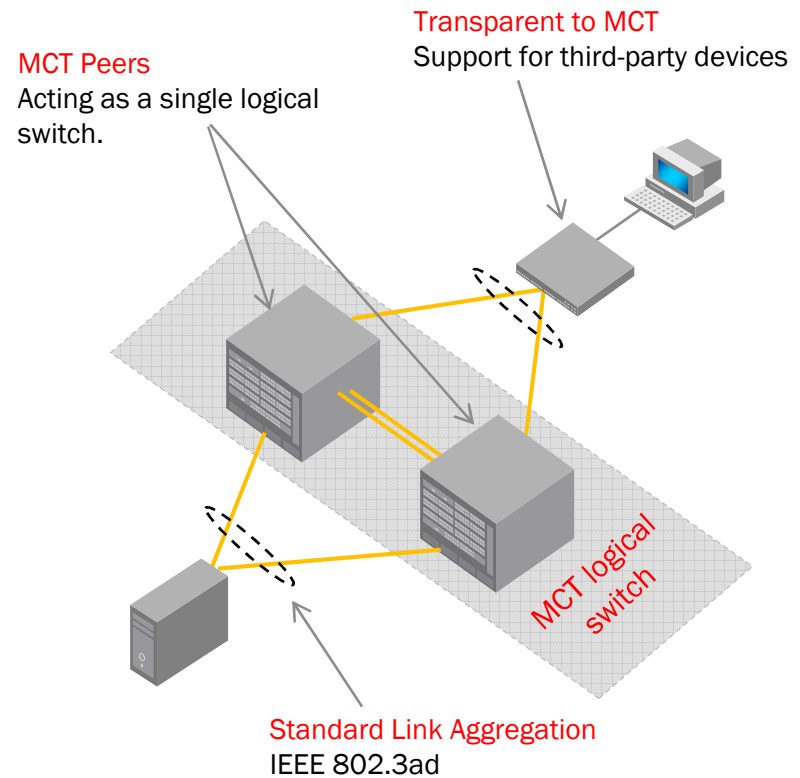
MPLS/VPLS connection between data centers and campuses



# Multi-Chassis Trunking

## How it works

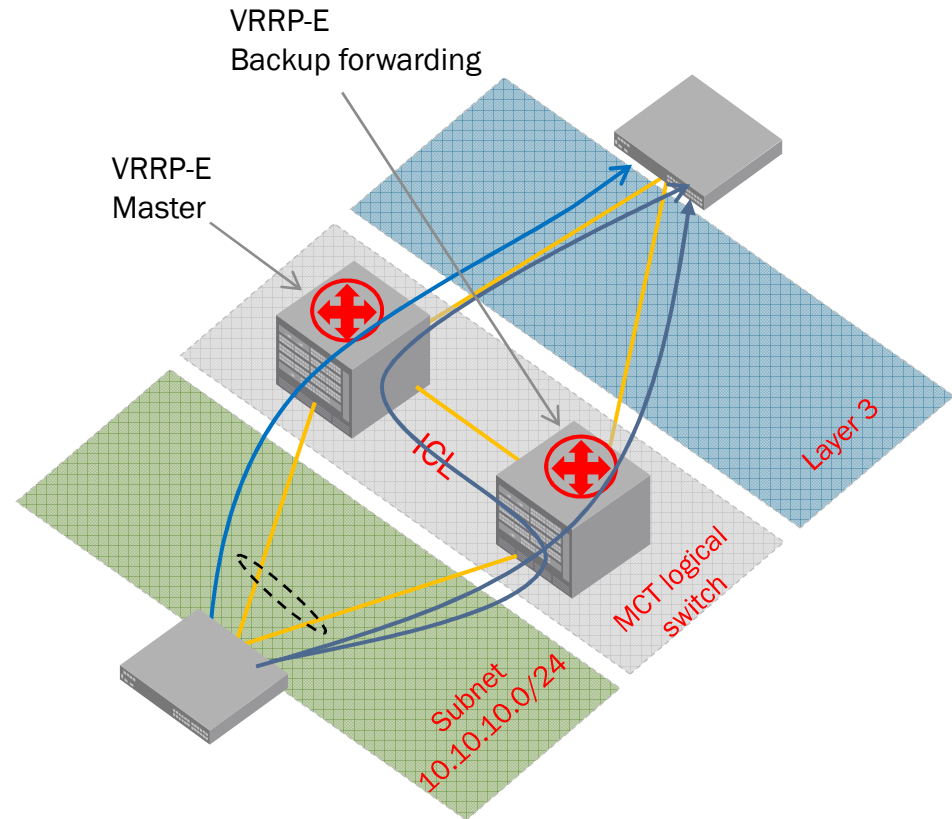
- Multi-Chassis Trunking (MCT)
  - Enhancement to Link Aggregation Groups
  - Provides nodal in addition to link and modular redundancy
  - Operates at the physical level to provide sub-second failover
- MCT Peers
  - Pair of physical switches act as one logical switch
  - Access switch/server connected via LAG
  - LAGs are spread across the MCT pair
- MCT Pair a single logical switch
  - No loop in the logical topology
  - All links are now Active/Active links
  - Sub-second for link/module or node failure



# Multi-Chassis Trunking

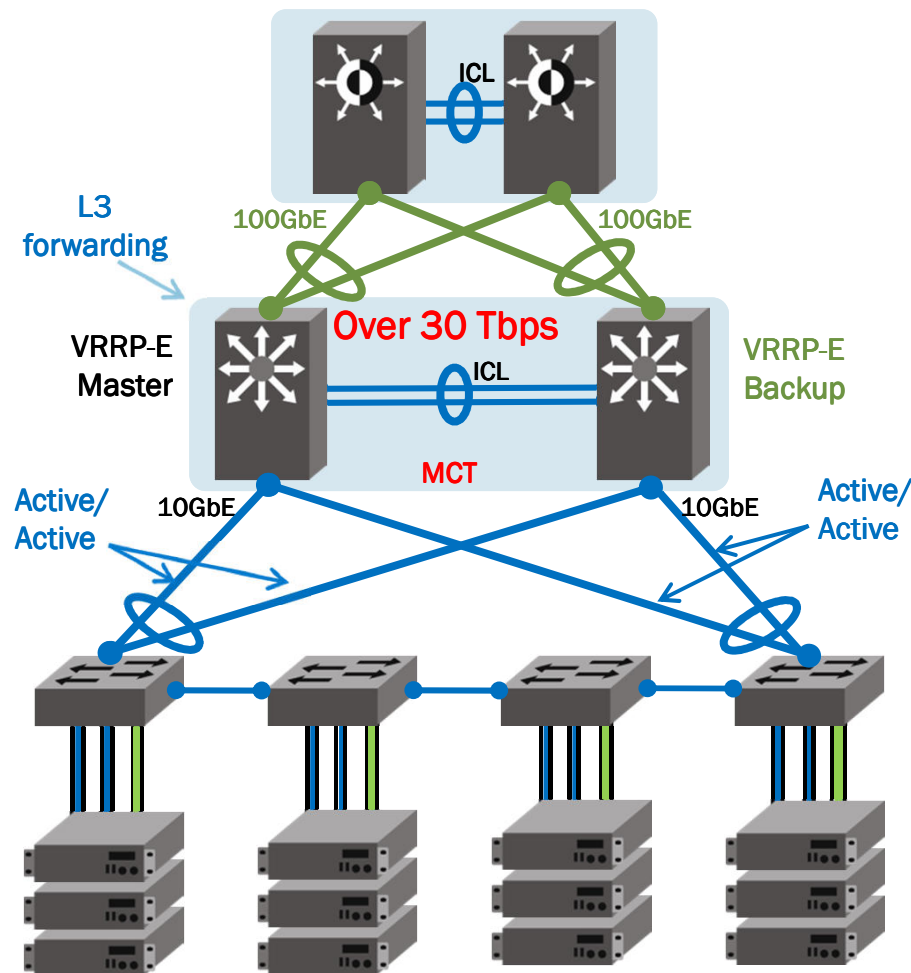
## Layer 3 redundancy

- Layer 3 redundancy provided by VRRP-E
  - Only the VRRP-E Master forwarding
  - VRRP-E standby only forwarding L2 traffic
  - Active-Standby configuration at L3
- VRRP-E Server Virtualization
  - VRRP-E Master and backup forwarding
  - Active-Active topology at layer 3
  - Active-Active topology at Layer 2



# Brocade MLXe Series

Simplified architecture & Operational Efficiency



- All links active (vs. active/passive) and forwarding Layer 2/3 traffic
- Highest resiliency sub-200ms link or node failover
- Over 30 Tbps switching capacity in Multi-Chassis for investment protection
- 32x100G wire-speed ports for demanding networks

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# Introducing Brocade Network Advisor

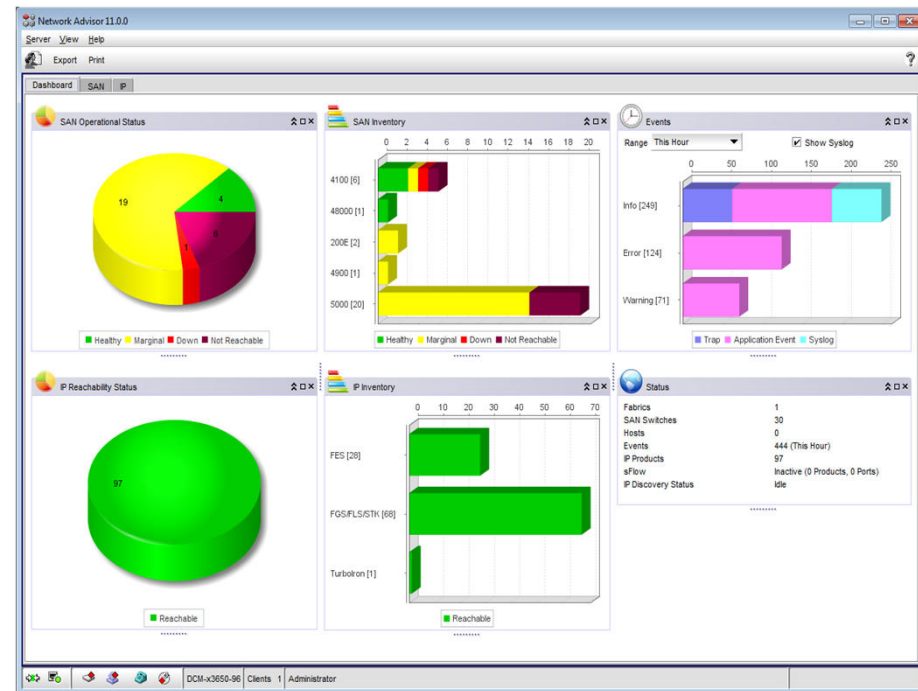
Single Pane of Glass Management for the Brocade One Architecture

## Unmatched Simplicity:

- Industry's first Unified Manager across SAN, IP (Wired, Wireless, MPLS) and Converged Networks

## Investment Protection:

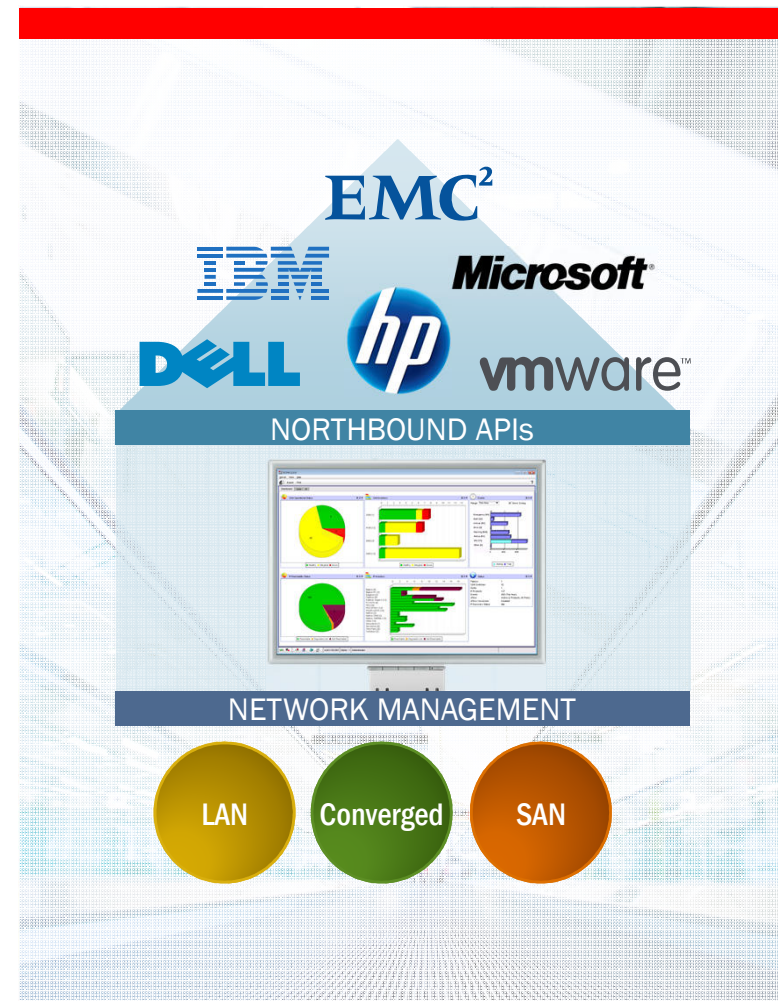
- Unified user experience across different types of networks with minimal re-learning
- Open Architecture with industry-standard APIs



# Brocade Network Advisor

End-to-End Service Orchestration with Leading Partner Products

- Open architecture with industry-standard APIs (SMI-S, Web Services, NETCONF, SNMP)
- Seamless integration with leading Orchestration Frameworks and Service Delivery platforms
- VMware and Microsoft hypervisor plug-ins

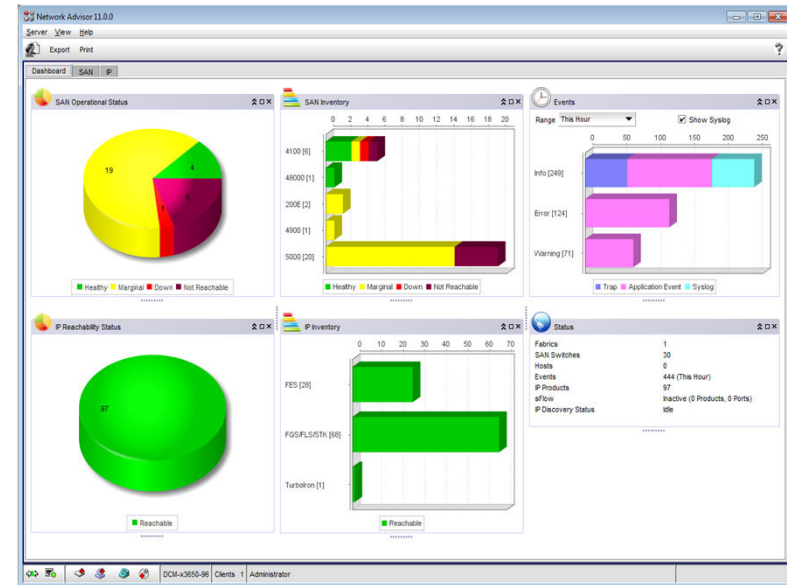




# Brocade Network Advisor for Data Centers

## Simplified Management Experience for SAN and IP Administrators

- Unified network management across SAN, IP, Application Delivery and Converged Networks
- Comprehensive lifecycle management from policy-based provisioning to troubleshooting and reporting
- Consistent user experience across network types with powerful role-based access control
- Seamless integration with Data Center Operational Products and Orchestration Frameworks



### Key Differentiators

- **Operational Simplicity:** Industry's only unified network manager across SAN and IP; features powerful user management capabilities for fine-grain control across administrative domains
- **Open Architecture:** Standards-based and ecosystem centric; delivers seamless integration with storage resource management, server management, virtualization and orchestration frameworks
- **Lower OpEx:** Consolidation of tools across administrative silos; consistent, train-once user Experience minimizes learning costs

# Summary

Massive scalability, less complexity, lower cost

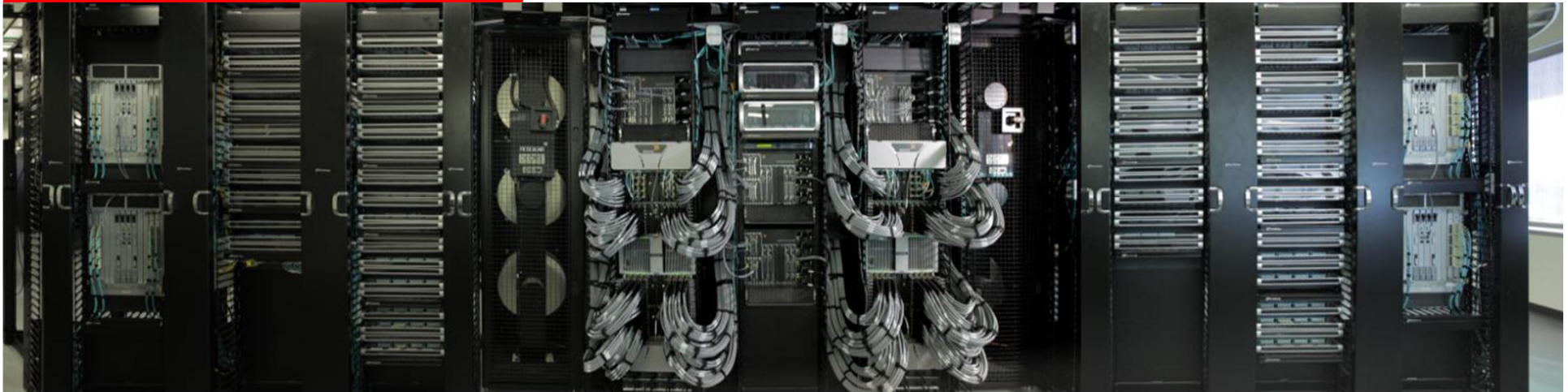


- New Brocade MLXe Router chassis models in the MLX Series
  - 4X the 100 GbE wire-speed density at 1/8<sup>th</sup> the cost of competing routers delivers significant economic advantage for Service Providers
  - 5X the performance of competing platforms enables virtualized Data Centers to support more traffic and provide Cloud services using *less* infrastructure, simplifying operations and lowering costs
  - Proven, advanced, standards-based routing without compromise
  - Full utilization of network with high availability
  - Router module interchangeability protects existing investments
  - 1 platform-software-mgmt app from SP to DC improves operational efficiency
- New 100 GbE Router Module at breakthrough price
- New Brocade Network Advisor unifies and simplifies management across IP, Storage, Wireless, Application Delivery, MPLS and Converged Networks





**WHEN YOU THINK NETWORKS,  
THINK BROCADE**



Thank You

## Brocade VCS

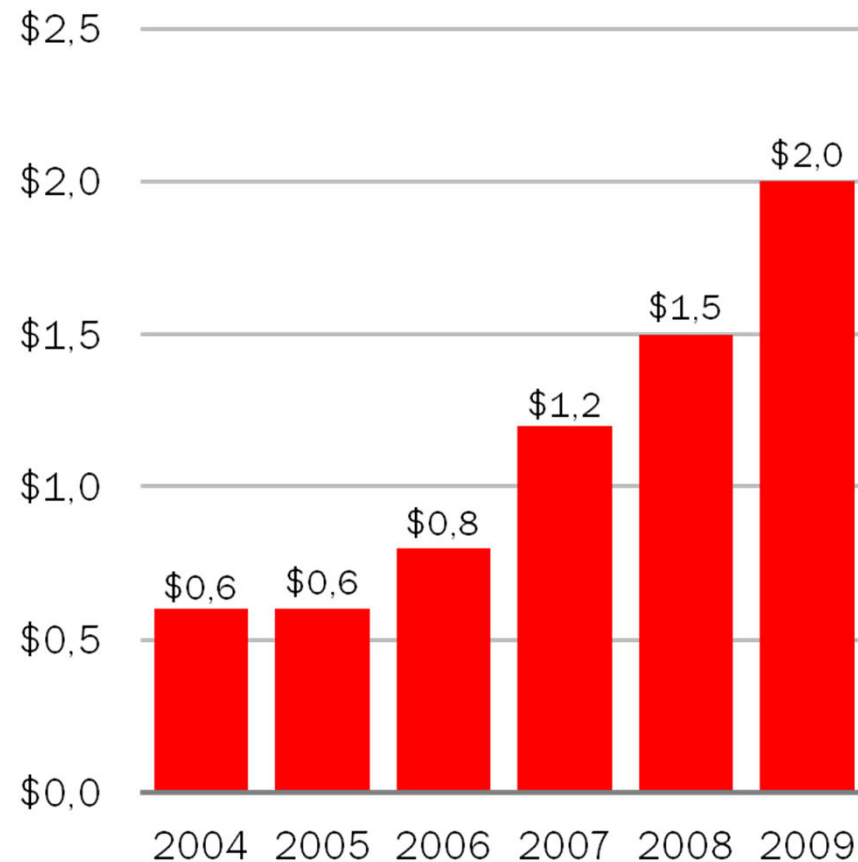


# Brocade

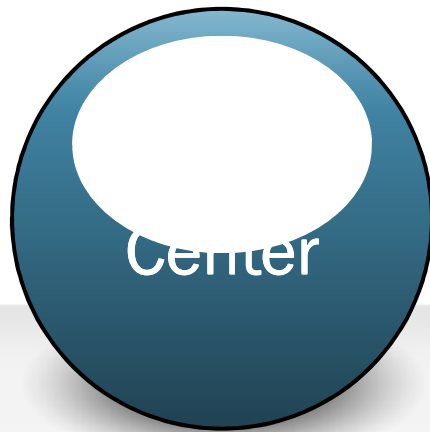
## Highest Performing Networks for Virtualized Data Centers

- Founded in May 1995
- 4000+ employees worldwide
- In every corner of the globe
- Over \$2 billion turnover in 2009
- Two lines of business:  
SAN – 70%  
LAN – 30%

### Annual Revenue (Billions)



## Focused on Three Distinct Segments





# EVOLUTION OF DATA CENTER

Trend towards the Virtualized Data Center

## HISTORICAL

Fixed Topologies

Static (devices,  
services, traffic pattern)

Fewer geographical  
locations

Network inefficiency

**Minimal VM usage**

Centralized Intelligence

## TODAY

Complexity of layers

Network inefficiency

Separate LAN & SAN

More geographical  
locations

**Moderate VM usage**

Centralized Intelligence

## FUTURE

Consolidation

High Performance

**Virtualization  
(scale and mobility)**

Simplification

Convergence (LAN & SAN)

Distributed Intelligence

LOWER COST – OPTIMUM EFFICIENCY – CLOUD-ENABLED



# Data Center Needs

- Lower costs
  - Consolidate, optimize resources; simplify
- Increase performance and reliability
  - Faster, consistent access; more with less
  - Minimize disruption, recover quickly
- Achieve agility
  - Deploy/re-deploy resources quickly and cost-effectively
- Expand and leverage Virtualization
  - Beyond \$ savings
  - App deployment and mobility

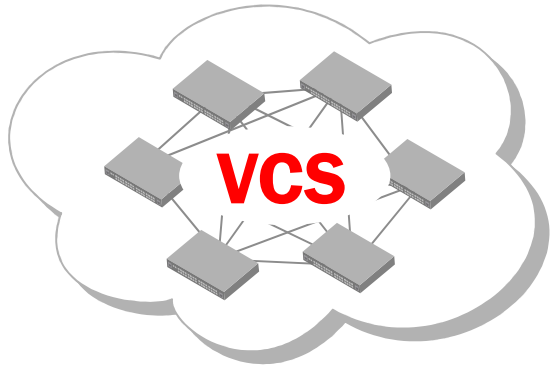


Needs



# Brocade Virtual Cluster Switching (VCS)

# VCS



First true data center Ethernet fabric

Revolutionizes Layer 2 connectivity

Increases scalability of virtual server environments and sphere of mobility

Maximizes network performance—  
reduces network complexity

## CORE TECHNOLOGY

# Brocade Virtual Cluster Switching (VCS)

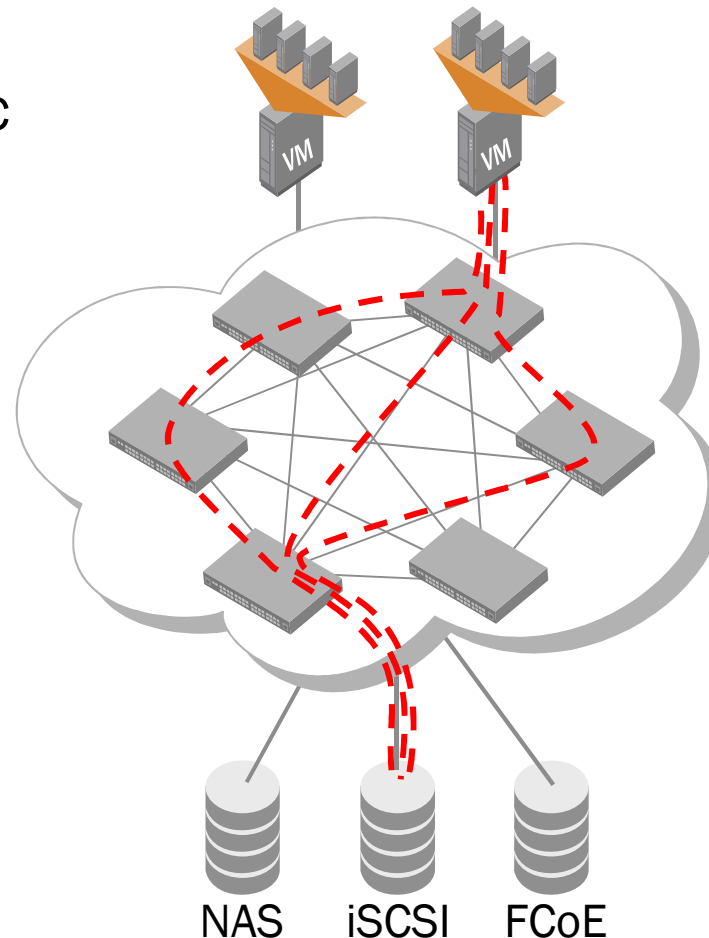
ETHERNET  
FABRIC

DISTRIBUTED  
INTELLIGENCE

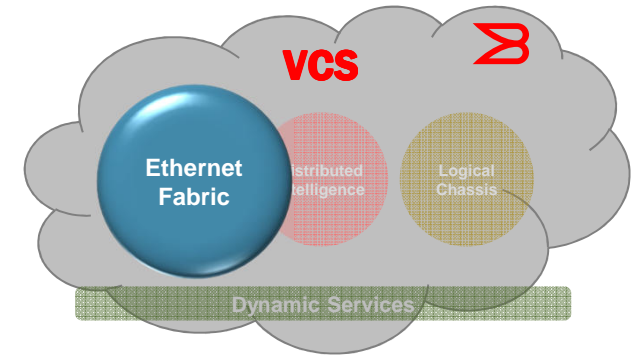
LOGICAL  
CHASSIS

DYNAMIC SERVICE  
INSERTION

- First data center Ethernet fabric
- No Spanning Tree Protocol
- Multi-path, deterministic
- Auto-healing, non-disruptive
- Lossless, low latency
- Built for convergence



# Ethernet Fabric Details



- 1<sup>st</sup> true Ethernet fabric
  - Layer 2 technology
- Link speed agnostic
- Data Center Bridging (DCB)
  - Lossless, deterministic
  - Priority-based Flow Control (PFC)
  - Enhanced Transmission Selection (ETS)
  - Data Center Bridging Exchange (DCBX)
- Transparent Interconnection of Lots of Links (TRILL)
  - Active multi-path
  - Multi-hop routing
  - Highly available, rapid link recovery
- LAN/SAN Convergence Ready
  - FCoE and iSCSI traffic
- Standards-based
  - Extends existing Ethernet infrastructure

## CORE TECHNOLOGY

# Brocade Virtual Cluster Switching (VCS)

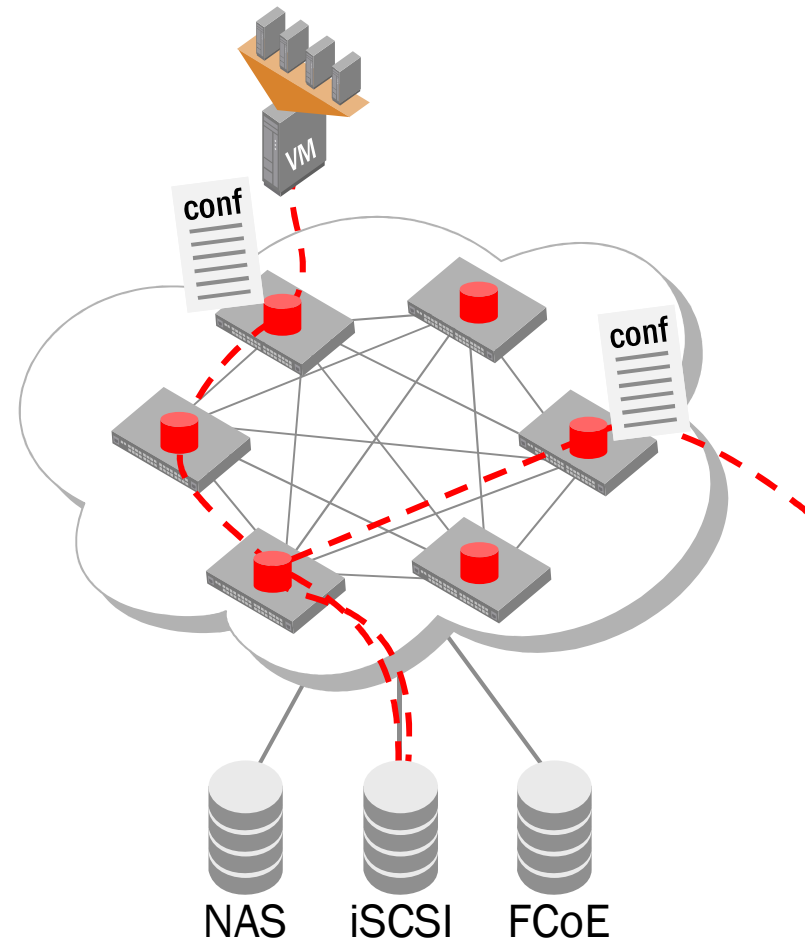
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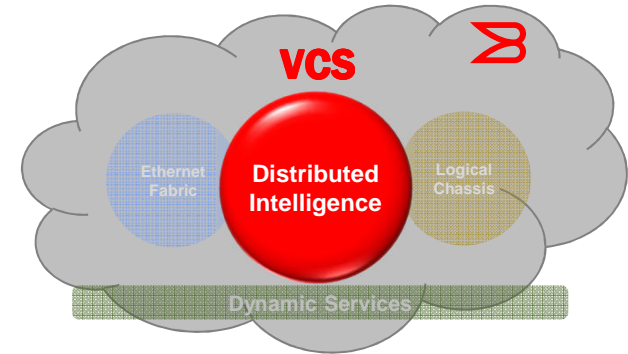
DYNAMIC SERVICE  
INSERTION

- Fully distributed control plane
- Arbitrary topology, self-forming
- Network-wide knowledge of all members, devices, VMs
- Automatic Migration of Port Profiles (AMPP)

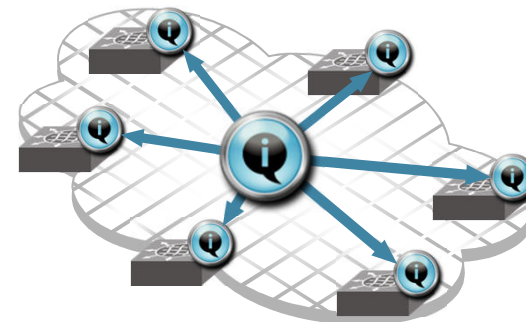
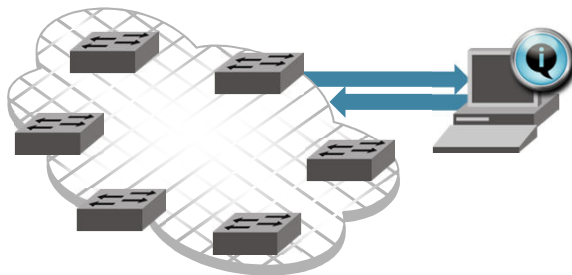




# Distributed Intelligence Details



- Distributed Fabric Services
  - Fabric is self-forming
  - Information shared across all fabric members
  - Fabric is aware of all devices connected
- Masterless Control
  - Switch or link failure does not require full fabric reconvergence
- Shared Port Profiles information
  - Automatic Migration of Port Profiles (AMPP)
  - Enables seamless VM migration without compromise



## CORE TECHNOLOGY

# Brocade Virtual Cluster Switching (VCS)

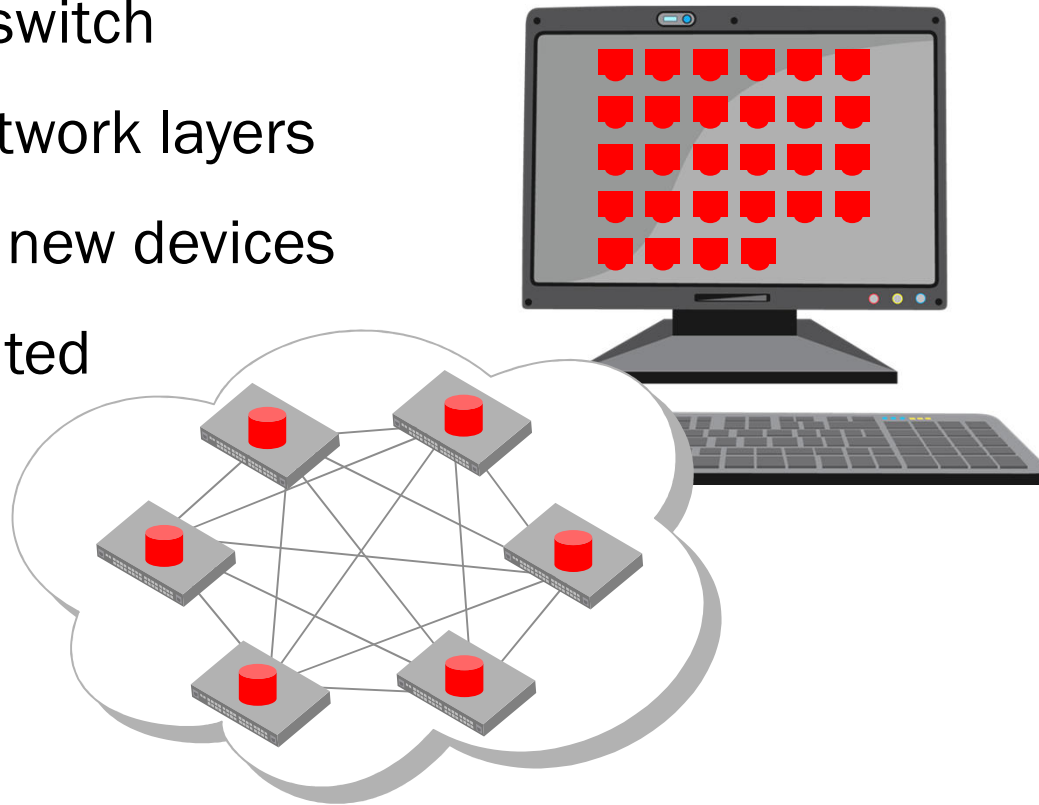
ETHERNET  
FABRIC

DISTRIBUTED  
INTELLIGENCE

LOGICAL  
CHASSIS

DYNAMIC SERVICE  
INSERTION

- Managed as a single switch
- Logically collapses network layers
- Auto-configuration for new devices
- Centralized or distributed management
- Radically reduces managed elements



## CORE TECHNOLOGY

# Brocade Virtual Cluster Switching (VCS)

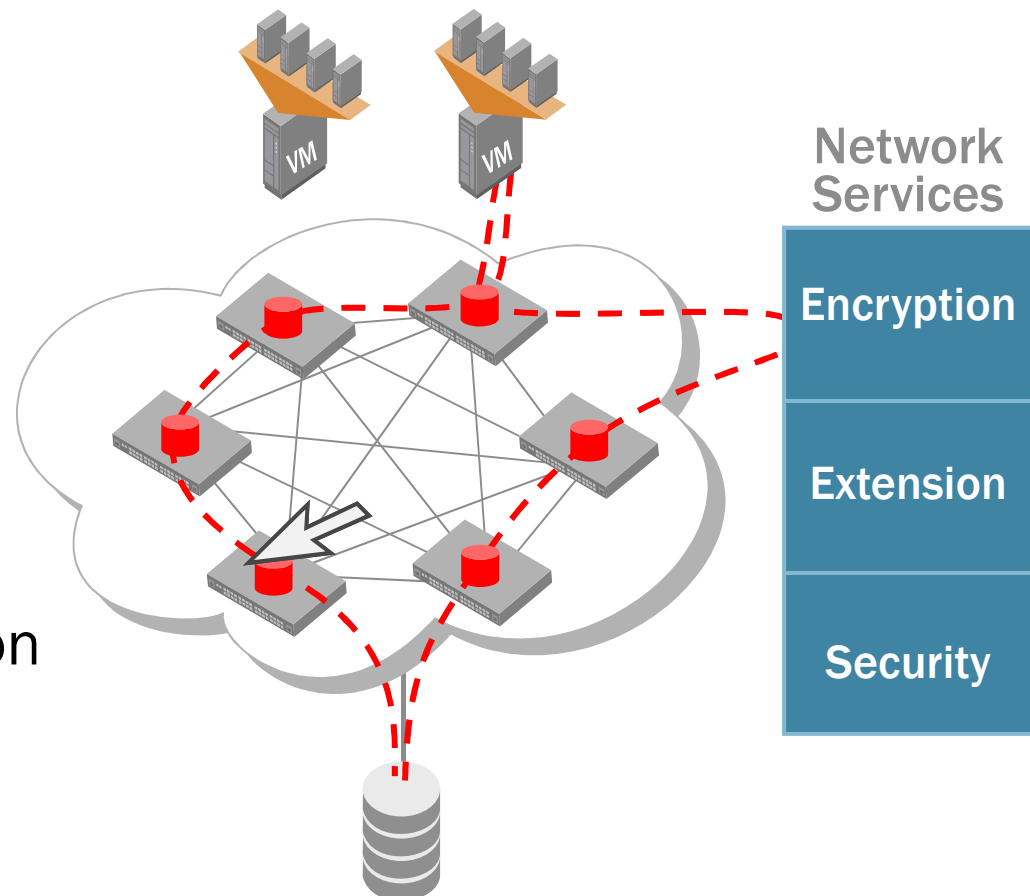
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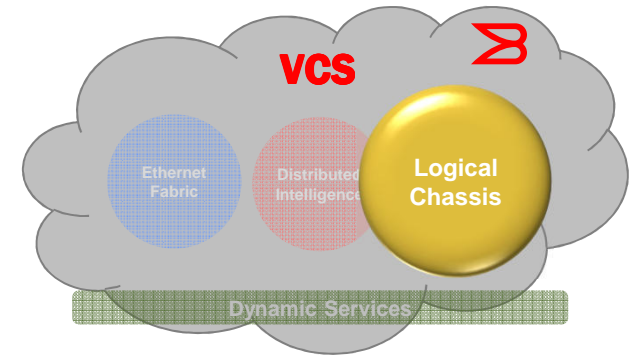
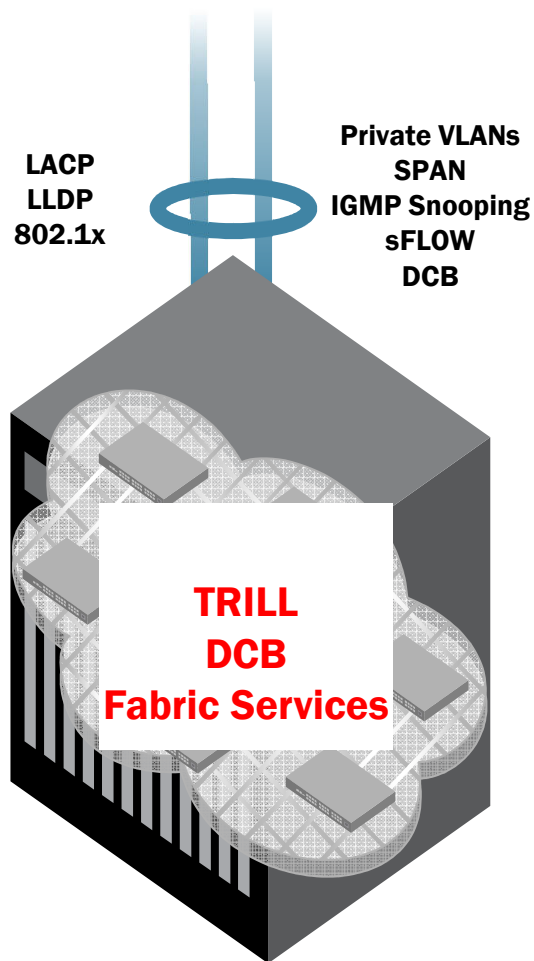
DYNAMIC SERVICE  
INSERTION

- Reconfigure network via software
- Hardware-based flow redirection
- Incorporation of partner services
- Non-stop service insertion
- Minimizes cost and physical moves



# Logical Chassis Details

## Single Logical Switch Behavior



- VCS behaves like a transparent LAN service
- Fabric protocols used within the fabric
  - TRILL, DCB, Fabric Services, etc.
- Industry-standard protocols used to communicate outside the fabric
  - LACP, 802.1x, sFLOW, etc.

# Brocade VDX 6720 Data Center Switches

## Product Highlights

- **Built for the Virtualized Data Center**
  - Uses Brocade fabric switching ASICs
  - First switches to run new Brocade Network Operating System
  - Virtual Cluster Switching (VCS) fabric technology
  - Automatic Migration of Port Profiles (AMPP)
- **Best-In-Class Performance and Density**
  - 24 and 60 port models with Ports On Demand
  - Non-blocking, cut-through architecture, wire-speed
  - 600 ns port-to-port latency; 1.8 us across port groups
- **Environmental Flexibility**
  - 10 Gb and 1 Gb supported on every port
  - Direct-attached copper, active optical, and SFP optical connectivity options
  - Less than 17" switch depth and reversible front-to-back airflow
- **Enables Network Convergence**
  - Complete FCoE support, multi-hop
  - iSCSI DCB support
- **Highly Resilient and Efficient Design**
  - Hot code load and activation
  - Remote Lights Out Management
  - Simplistic design, optimal power efficiency

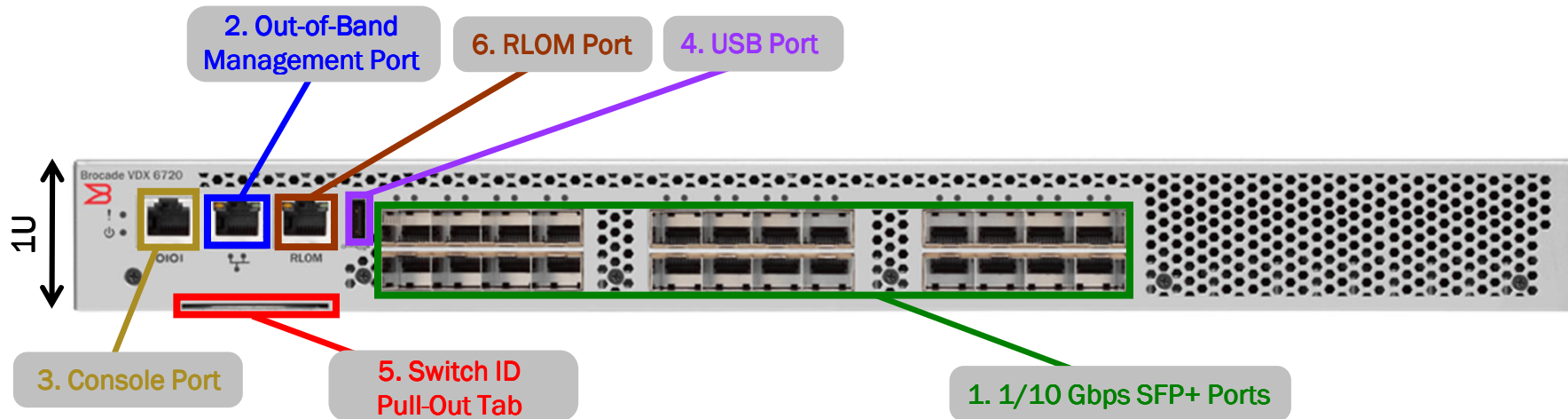


Data Center Access



# Brocade VDX 6720-24 Switch

## Front View

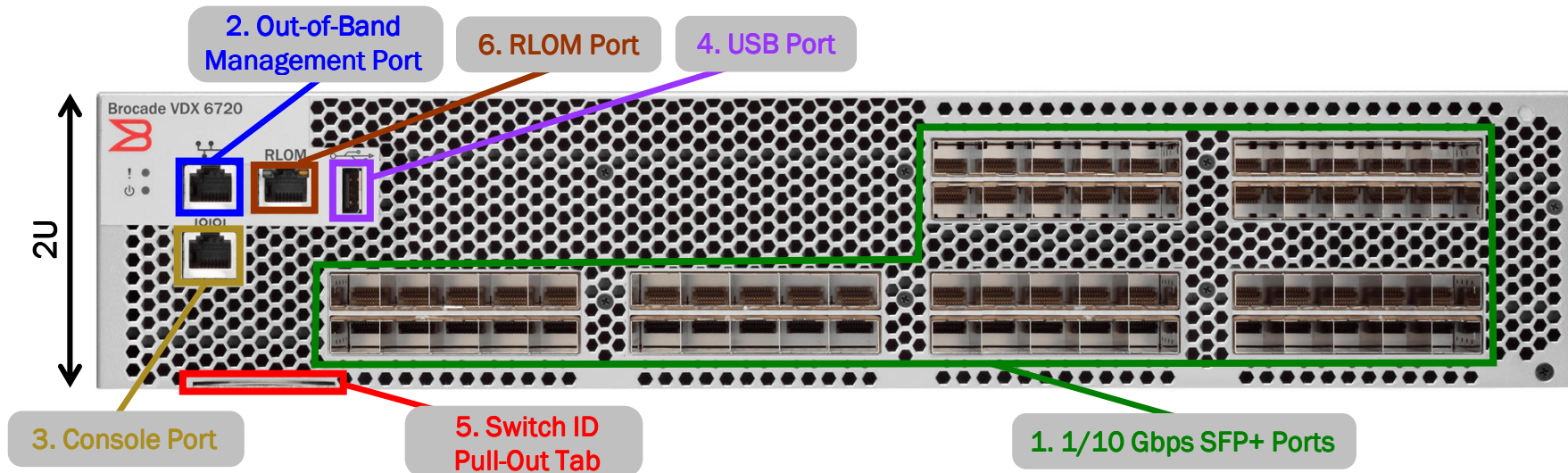


- Compact 1U form factor
- 1. 16 or 24 1/10 Gbps SFP+ ports with Ports On Demand (POD)
- 2. RJ-45 Ethernet port for out-of-band management
- 3. RS-232 port for console access
- 4. USB port for firmware upgrades and system log downloads
- 5. Switch ID pull-out tab containing serial number and MAC address
- 6. Remote Lights Out Management (RLOM) port



# Brocade VDX 6720-60 Switch

## Front View



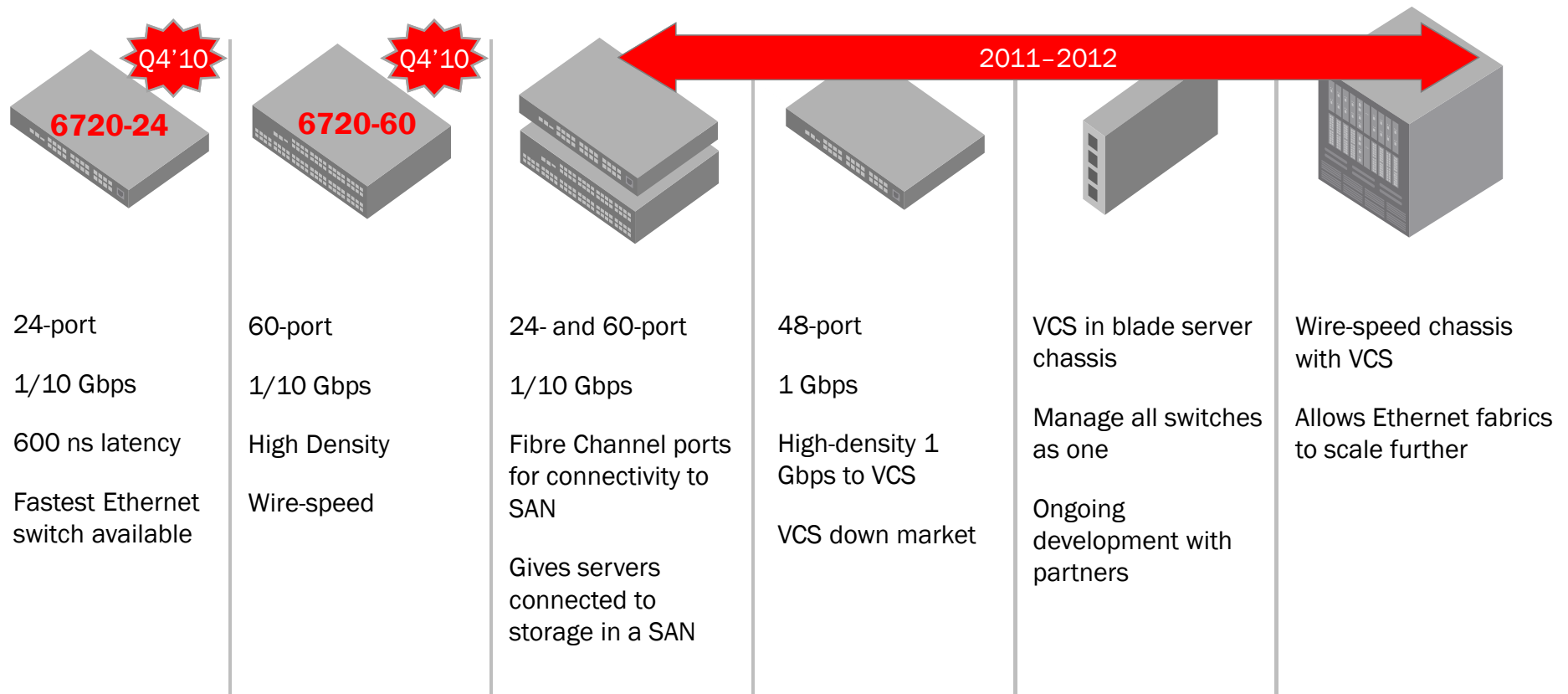
- Compact 1U form factor
- 1. 40, 50, or 60 1/10 Gbps SFP+ ports with Ports On Demand (POD)
- 2. RJ-45 Ethernet port for out-of-band management
- 3. RS-232 port for console access
- 4. USB port for firmware upgrades and system log downloads
- 5. Switch ID pull-out tab containing serial number and MAC address
- 6. Remote Lights Out Management (RLOM) port

# Brocade VDX Product Family

Delivering Virtual Cluster Switching



A new family of Ethernet Fabric switches





# BROCADE ONE™

A Unified Network Strategy and Architecture



**Thank You**

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